

## Eleventh Grade Math Extended Indicators

<b>MA 11.1</b>	<b>NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.</b>
<b>MA 11.1.1</b>	<b>Numeric Relationships: Students will demonstrate, represent, and show relationships among the subsets of real numbers and the complex number system.</b>
MA 11.1.1.a	Compare and contrast subsets of the complex number system, including imaginary, rational, irrational, integers, whole, and natural numbers.
<b>MAE 11.1.1.a</b>	<b>Sort fractions, decimals, and whole numbers by type (e.g., <math>\frac{3}{5}</math>, 4, 1.7).</b>
MA 11.1.1.b	Recognize that closure properties apply to the subsets of the complex number system, under the standard operations.
MA 11.1.1.c	Use drawings, words, and symbols to explain the effects of operations such as multiplication and division on the magnitude of quantities in the real number system, including powers and roots (e.g., if you take the square root of a number, will the result always be smaller than the original number?).
<b>MA 11.1.2</b>	<b>Operations: Students will compute with real and complex numbers.</b>
MA 11.1.2.a	Compute with subsets of the complex number system, including imaginary, rational, irrational, integers, whole, and natural numbers.
<b>MAE 11.1.2.a</b>	<b>Add and subtract two-digit numbers with regrouping.</b>
MA 11.1.2.b	Simplify expressions with rational exponents.
<b>MAE 11.1.2.b</b>	<b>Rewrite a repeated multiplication problem as an exponential expression with a whole number base and a whole number exponent (e.g., <math>3 \times 3 \times 3 \times 3 = 3^4</math>).</b>
MA 11.1.2.c	Select, apply, and explain the method of computation when problem solving using real numbers (e.g., models, mental computation, paper-pencil, or technology).
<b>MAE 11.1.2.c</b>	<b>Given a real-world problem, identify an operation that leads to a solution.</b>
MA 11.1.2.d	Use estimation methods to check the reasonableness of real number computations and decide if the problem calls for an approximation (including appropriate rounding) or an exact number.
<b>MA 11.2</b>	<b>ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.</b>
<b>MA 11.2.1</b>	<b>Algebraic Relationships: Students will demonstrate, represent, and show relationships with functions.</b>
MA 11.2.1.a	Define a function and use function notation.

MA 11.2.1.b	Analyze a relation to determine if it is a function given graphs, tables, or algebraic notation.
<b>MAE 11.2.1.b</b>	<b>Identify a graph that represents a given linear function from a table.</b>
MA 11.2.1.c	Classify a function given graphs, tables, or algebraic notation, as linear, quadratic, or neither.
<b>MAE 11.2.1.c</b>	<b>Identify a linear function from a graph.</b>
MA 11.2.1.d	Identify domain and range of functions represented in either algebraic or graphical form.
MA 11.2.1.e	Analyze and graph linear functions and inequalities (point-slope form, slope-intercept form, standard form, intercepts, rate of change, parallel and perpendicular lines, vertical and horizontal lines, and inequalities).
<b>MAE 11.2.1.e</b>	<b>Given an x-, y- table of values, determine if the graph of the values forms a horizontal line or a vertical line.</b>
MA 11.2.1.f	Analyze and graph absolute value functions (finding the vertex, symmetry, transformations, determine intercepts, and minimums or maximums using the piecewise definition).
MA 11.2.1.g	Analyze and graph quadratic functions (standard form, vertex form, finding zeros, symmetry, transformations, determine intercepts, and minimums or maximums).
<b>MAE 11.2.1.g</b>	<b>Use the graph of a linear function to locate the ordered pair where <math>y = 0</math>.</b>
MA 11.2.1.h	Represent, interpret, and analyze inverses of functions algebraically and graphically.
<b>MA 11.2.2</b>	<b>Algebraic Processes: Students will apply the operational properties when evaluating rational expressions and solving linear and quadratic equations and inequalities.</b>
MA 11.2.2.a	Convert equivalent rates (e.g., miles per hour to feet per second).
<b>MAE 11.2.2.a</b>	<b>Convert equivalent rate using money.</b>
MA 11.2.2.b	Identify and explain the properties used in solving equations and inequalities.
MA 11.2.2.c	Simplify algebraic expressions involving integer and fractional exponents.
MA 11.2.2.d	Perform operations on rational expressions (add, subtract, multiply, divide, and simplify).
<b>MAE 11.2.2.d</b>	<b>Add two linear expressions (e.g., <math>(2x + 1) + (3x + 2) = 5x + 3</math>).</b>
MA 11.2.2.e	Evaluate expressions at specified values of their variables (polynomial, rational, radical, and absolute value).
<b>MAE 11.2.2.e</b>	<b>Evaluate a linear expression at a specified value of the variable. Include cases where combining like terms or using the distributive property is necessary (e.g., Evaluate <math>3x + 8 - 2x</math> when <math>x = 5</math>. Evaluate <math>2(x - 1)</math> when <math>x = 8</math>).</b>
MA 11.2.2.f	Solve an equation involving several variables for one variable in terms of the others.
MA 11.2.2.g	Solve linear and absolute value equations and inequalities.
<b>MAE 11.2.2.g</b>	<b>Identify the absolute value of a negative integer.</b>
MA 11.2.2.h	Analyze and solve systems of two linear equations and inequalities in two variables algebraically and graphically.

<b>MAE 11.2.2.h</b>	<b>Identify the ordered pair of the graphical solution to a system of two linear equations.</b>
MA 11.2.2.i	Perform operations (addition subtraction, multiplication, and division) on polynomials.
MA 11.2.2.j	Factor polynomials to include factoring out monomial terms and factoring quadratic expressions.
MA 11.2.2.k	Recognize polynomial multiplication patterns and their related factoring patterns (e.g., $(a + b)^2 = a^2 + 2ab + b^2$ , $a^2 - b^2 = (a + b)(a - b)$ ).
MA 11.2.2.l	Make the connection between the factors of a polynomial and the zeros of a polynomial.
MA 11.2.2.m	Combine functions by composition and perform operations (addition, subtraction, multiplication, division) on functions.
MA 11.2.2.n	Solve quadratic equations involving real coefficients and real or imaginary roots.
<b>MA 11.2.3</b>	<b>Applications: Students will solve real-world problems involving linear equations and inequalities, systems of linear equations, quadratic, exponential, square root, and absolute value functions.</b>
MA 11.2.3.a	Analyze, model, and solve real-world problems using various representations (graphs, tables, linear equations and inequalities, systems of linear equations, quadratic, exponential, square root, and absolute value functions).
<b>MA 11.3</b>	<b>GEOMETRY: Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.</b>
<b>MA 11.3.1</b>	<b>Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.</b>
MA 11.3.1.a	Know and use precise definitions of ray, line segment, angle, perpendicular lines, parallel lines, and congruence based on the undefined terms of geometry: point, line, and plane.
MA 11.3.1.b	Prove geometric theorems about angles, triangles, congruent triangles, similar triangles, parallel lines with transversals, and quadrilaterals using deductive reasoning.
MA 11.3.1.c	Apply geometric properties to solve problems involving similar triangles, congruent triangles, quadrilaterals, and other polygons.
<b>MAE 11.3.1.c</b>	<b>Identify corresponding angles of congruent triangles.</b>

MA 11.3.1.d	Identify and apply right triangle relationships including sine, cosine, tangent, special right triangles, and the converse of the Pythagorean Theorem.
<b>MAE 11.3.1.d</b>	<b>Distinguish between right triangles and non-right triangles.</b>
MA 11.3.1.e	Create geometric models to visualize, describe, and solve problems using similar triangles, right triangles, and trigonometry.
MA 11.3.1.f	Know and use precise definitions and terminology of circles, including central angle, inscribed angle, arc, intercepted arc, chord, secant, and tangent.
MA 11.3.1.g	Apply the properties of central angles, inscribed angles, angles formed by intersecting chords, and angles formed by secants and/or tangents to find the measures of angles related to the circle.
MA 11.3.1.h	Sketch, draw, and construct appropriate representations of geometric objects using a variety of tools and methods which may include ruler/straight edge, protractor, compass, reflective devices, paper folding, or dynamic geometric software.
<b>MA 11.3.2</b>	<b>Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.</b>
MA 11.3.2.a	Derive and apply the midpoint formula.
MA 11.3.2.b	Use coordinate geometry to analyze linear relationships to determine if lines are parallel or perpendicular.
<b>MAE 11.3.2.b</b>	<b>Distinguish between perpendicular, intersecting, and parallel lines.</b>
MA 11.3.2.c	Given a line, write the equation of a line that is parallel or perpendicular to it.
<b>MAE 11.3.2.c</b>	<b>Identify graphs of linear equations that have parallel lines or same slopes.</b>
MA 11.3.2.d	Derive and apply the distance formula.
<b>MAE 11.3.2.d</b>	<b>Identify the hypotenuse of right triangles.</b>
MA 11.3.2.e	Use coordinate geometry to prove triangles are right, acute, obtuse, isosceles, equilateral, or scalene.
<b>MAE 11.3.2.e</b>	<b>Identify isosceles, equilateral, or scalene triangles.</b>
MA 11.3.2.f	Use coordinate geometry to prove quadrilaterals are trapezoids, isosceles trapezoids, parallelograms, rectangles, rhombi, kites, or squares.
<b>MAE 11.3.2.f</b>	<b>Identify the quadrilateral on the coordinate grid as a trapezoid, a rectangle, or a kite.</b>
MA 11.3.2.g	Perform and describe positions and orientation of shapes under a single translation using algebra.
MA 11.3.2.h	Perform and describe positions and orientation of shapes under a rotation about the origin in multiples of 90 degrees using algebraic notation on a coordinate plane.
MA 11.3.2.i	Perform and describe positions and orientation of shapes under a reflection across a line using algebraic notation on a coordinate plane.

MA 11.3.2.j	Perform and describe positions and orientation of shapes under a single dilation on a coordinate plane.
MA 11.3.2.k	Derive the equation of a circle given the radius and the center.
<b>MA 11.3.3</b>	<b>Measurement: Students will perform and compare measurements and apply formulas.</b>
MA 11.3.3.a	Convert between various units of length, area, and volume (e.g., square feet to square yards).
MA 11.3.3.b	Convert between metric and standard units of measurement.
MA 11.3.3.c	Apply the effect of a scale factor to determine the length, area, and volume of similar two- and three-dimensional shapes and solids.
MA 11.3.3.d	Find arc length and area of sectors of a circle.
<b>MAE 11.3.3.d</b>	<b>Find the arc length of a circle as one-fourth, one-half, or three-fourths of the circle.</b>
MA 11.3.3.e	Determine surface area and volume of spheres, cones, pyramids, and prisms using formulas and appropriate units.
<b>MAE 11.3.3.e</b>	<b>Find the surface area of one face of a rectangular prism.</b>
<b>MA 11.4</b>	<b>DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.</b>
<b>MA 11.4.1</b>	<b>Representations: Students will create displays that represent data.</b>
	<b>No additional indicator(s) at this level. Mastery is expected at previous grade levels.</b>
<b>MA 11.4.2</b>	<b>Analysis &amp; Applications: Students will analyze data to address the situation.</b>
MA 11.4.2.a	Identify and compute measures of central tendency (mean, median, mode) when provided data both with and without technology.
<b>MAE 11.4.2.a</b>	<b>Find the mean or median of an odd-numbered set of ordered data.</b>
MA 11.4.2.b	Explain how transformations of data, including outliers, affect measures of central tendency.
MA 11.4.2.c	Compare data sets and formulate conclusions.
MA 11.4.2.d	Support conclusions with valid arguments.

MA 11.4.2.e	Develop linear equations for linear models to predict unobserved outcomes using the regression line and correlation coefficient with technology.
MA 11.4.2.f	Describe the shape, identify any outliers, and determine the spread of a data set.
MA 11.4.2.g	Explain the impact of sampling methods, bias, and the phrasing of questions asked during data collection, and the conclusions that can rightfully be made.
MA 11.4.2.h	Explain the differences between a randomized experiment and observational studies.
MA 11.4.2.i	Using scatter plots, analyze patterns and describe relationships in paired data.
MA 11.4.2.j	Recognize when arguments based on data confuse correlation with causation.
MA 11.4.2.k	Interpret data represented by the normal distribution, formulate conclusions, and recognize that some data sets are not normally distributed.
<b>MA 11.4.3</b>	<b>Probability: Students will interpret and apply concepts of probability.</b>
MA 11.4.3.a	Construct sample spaces and probability distributions.
MA 11.4.3.b	Use appropriate counting techniques to determine the probability of an event.
<b>MAE 11.4.3.b</b>	<b>Determine the possible outcomes of flipping a fair coin twice.</b>
MA 11.4.3.c	Determine if events are mutually exclusive and calculate their probabilities in either case.
<b>MAE 11.4.3.c</b>	<b>Identify a pair of mutually exclusive outcomes.</b>